Determinants of Depression in Older Adults in Europe: An Investigation into Demographic and Psychosocial Risk Factors

Dissertation

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1. Introduction

1.1 No Health without Mental Health

Mental health is an integral component of health, and the World Health Organization (WHO) has endorsed the view that there can be “No Health without Mental Health”. This statement captures the essence of the WHO constitution which states that “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). Mental health is defined as a state of well-being in which an individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community (WHO, 2004). The importance of mental health for the wellbeing and quality of life of an individual is indisputable, and has an impact at a societal level; where good mental health is also essential for the social and economic welfare of a nation (Buber & Englehardt, 2011).Therefore, mental health should be considered as an integral and essential part of other public policy areas such as human rights, social care, education and employment (WHO, 2005).

1.2 Ageing as a Public Health Concern

Over the past 50 years, the number of people aged 60 years or over has tripled worldwide, and it is estimated that by the year 2050, this number will more than double– from 841 million to over two billion (United Nations, 2013). Of all the world regions, Europe has the highest proportion of population aged 65 or over, and by 2030, the number of Europeans aged 75 years and over is expected to account for 12% of the population, while those aged 80 years and over will represent 7% of the population of Europe (Rueda, Artazcoz, & Navarro, 2008). Figure 1 and 2 below illustrate this increased trend in population, demonstrated by the

dynamic shift of the population structure towards the older age groups in the European Union (Eurostat, 2015). It is therefore apparent that the unprecedented speed at which the population of Europe is ageing will inevitably be accompanied by a disproportionate increase in the rate of mental disorders, such as depression and anxiety (WHO, 2004), since chronological age increases the risk of mental disorders through increased exposure to circumstances associated with higher risks of mental disorders (e.g. bereavement, somatic illnesses and poverty).

This rapid growth of the older population and its subsequent threat to the burden of mental disorders in Europe has prompted a growing interest in the quality of life of the older age group, in particular the impact of depression and anxiety in this cohort (Grundy, 2006). Moreover, it has generated international concern related to health expenditure and the economic sustainability of national pension systems (Rueda, Artazcoz, & Navarro, 2008), and the additional consequences of mental disorders on the economy, where the cost of mood and anxiety disorders combined for the year 2010 has been estimated to be almost €190 billion PPP (Purchasing Power Parity) (Gustavsson, et al., 2011). Since late-life depression and anxiety are major public health issues resulting in many devastating health outcomes, it is of utmost significance to conduct research to contribute to our understanding of the health, well-being and the economic and social circumstances of older people, and it is crucial for governments and stakeholders to set infrastructure in place to prevent these mental disorders and promote positive ageing.

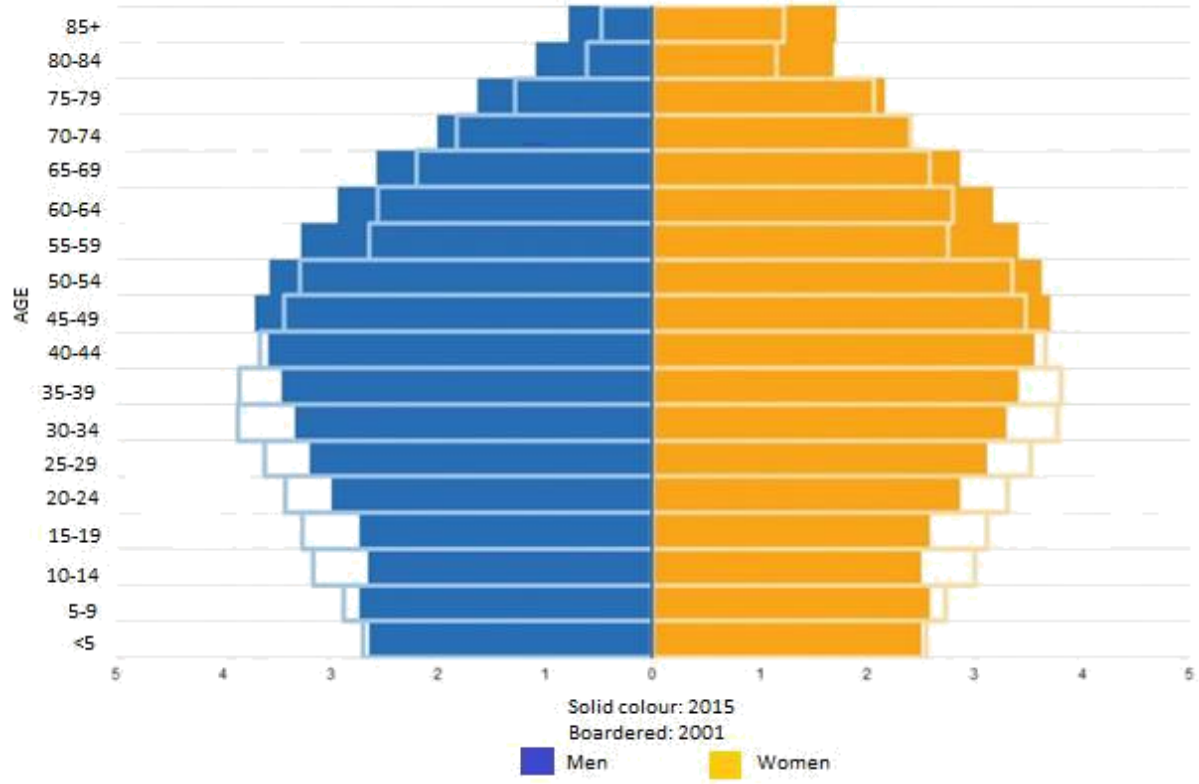

Figure 1: Population growth of the European Union between 2001 (bordered) and 2015 (solid colour). Source: Eurostat, 2015

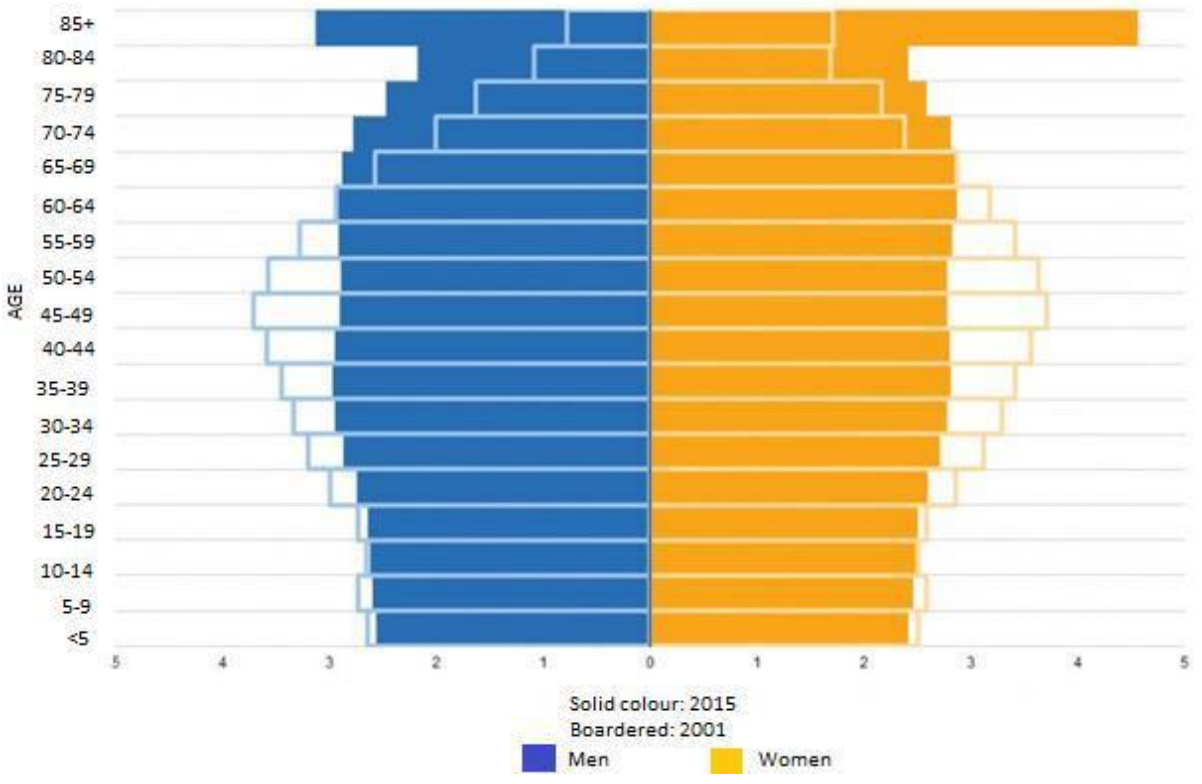

Figure 2: Population growth of the European Union between 2001 (bordered) and 2015 (solid colour). Source: Eurostat, 2015

1.3 Mental Disorders in the Older European Population

1.3.1 Prevalence

Mental disorders contribute substantially to the global burden of disease (WHO, 1992), and in Europe, it is estimated that every year, over 27% of adults experience mental ill-health (Wittchen & Jacobi, 2005). Mood and anxiety disorders are amongst the most common mental disorders in older adults (Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010), and it is predicted that by 2030, depression and anxiety will be the leading contributors to the global burden of disease (WHO, 2008), posing a significant public health challenge.

Depression is a growing health concern in Europe, and is the fourth most important cause of years lost due to disability in Western Europe (Murray et al., 2012). The prevalence of depression varies considerably both within and between countries across Europe (Wittchen & Jacobi, 2005; Kessler & Bromet, 2013), which may represent the role of contextual factors, such as economic, demographic, health care services, and environmental factors on the development and prevalence of depression (Ayuso-Mateos, et al., 2001; WHO, 2004; Kovess-Masfety, Alonso, deGraaf, & Demyttenaere, 2005).

Anxiety disorders are even more common than depression among the elderly (Beekman, et al., 2000; Regier, George, Karno, & Locke, 1988; Singleton, Bumpstead, O'Brien, Lee, & Meltzer, 2000), and are frequently co-morbid with other medical and psychiatric conditions (Blay & Marinho, 2012; Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010), particularly depression (Lenze et al., 2000). The prevalence estimates across different populations range from 3.2% to 14.2% in late life (Forsell & Winblad, 1997; Ritchie et al., 2004), and the significant impact of anxiety disorders in the elderly and are associated with an increased risk of cognitive decline, disability, healthcare utilization and poor quality of life (Blay & Marinho, 2012; Porensky, et al., 2009). Although it is evident that

anxiety is a significant health concern among the elderly, and while one of the following studies in the current dissertation included both constructs (depression and anxiety) in the analysis, in order to make a more comprehensive assessment of their prevalence in the elderly, the main focus of the current dissertation is primarily on the determinants and the impact of depression in older adults.

1.3.2 Depression in the Elderly

Depression among older adults is a growing public health concern (Figure 3), and the impact of late-life depression has aroused much interest in recent years. There has been conflicting results regarding the prevalence of depression in later life, where some studies report that the prevalence of depression grows with increasing age (Kanowski, 1994; Weissman; Prince, Beekman, Deeg, Fuhrer, et al., 1999; Fiske & Gatz, 2003), while others illustrate that the prevalence of depression reduces when controlling for age-effects (Blazer, 2003; Newman, 1989). This incongruence has yet to be satisfactorily explained. However, since depression in old age is not a normal part of ageing, considering that over 50% of older adults who present with depression have no prior history of the disease (Fiske, Wetherell, & Gatz, 2009), there is general agreement that the risk for late-onset depression in older adults comprises of a complex interaction between psychological, social, and biological determinants (Fiske, Wetherell, & Gatz, 2009). Some literature has suggested that the gender gap in the levels of depression may narrow with age (Barefoot, Mortensen, Helms, Avlund, & Schroll, 2001), while other studies report that levels of depression remain higher among women than men throughout late life (Kessler, Foster, Webster, & House, 1992; Fiske & Gatz, 2003). Irrespective of this incongruence, late-onset depression is hypothesised to be associated with age related factors, such as comorbidity of physical illness, cognitive decline,

structural changes in the brain, and bereavement (Bolla-Wilson & Bleecker, 1989; Fiske, Wetherell, & Gatz, 2009). Additionally, depression in older adults has also been associated with low socio-economic status (SES) and negative ageing perceptions (Zivin, et al., 2010; Wurm & Benyamini, 2014; Sindi, et al., 2012).

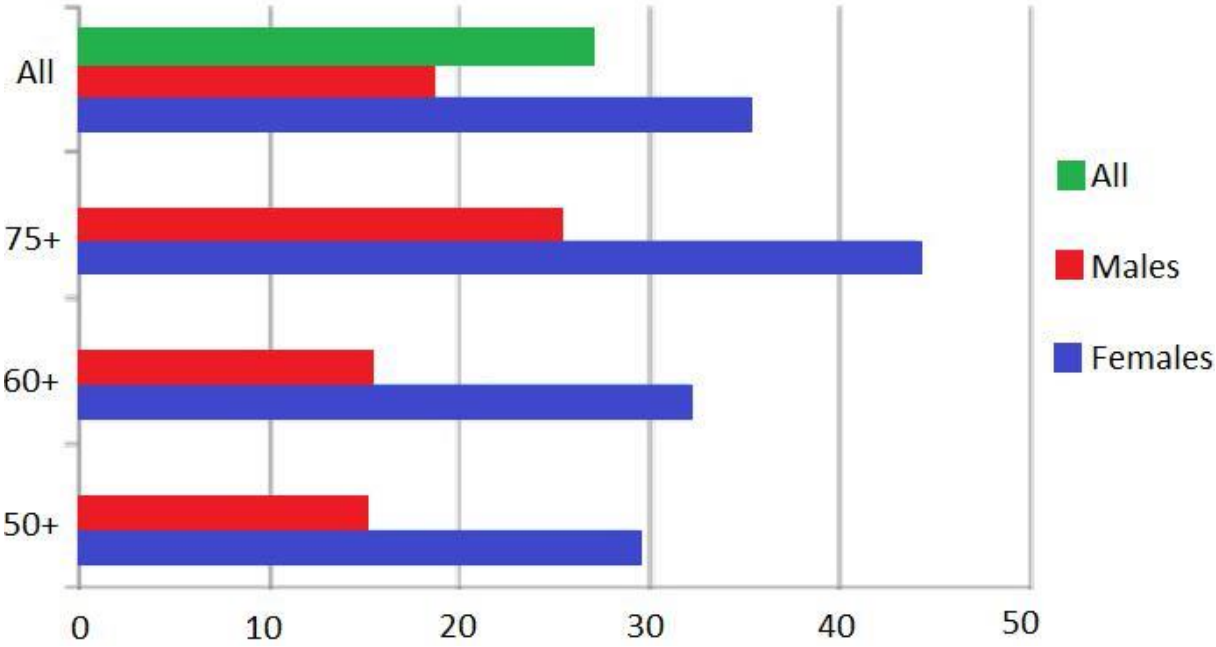

Figure 3: The % of older people reporting current depression symptoms in 9 European countries (Source: Survey on Health, Ageing and Retirement in Europe (Survey of Health)

1.4 Socioeconomic Status and Depression

Socioeconomic inequalities in health (also known as the socioeconomic gradient) constitute a critical public health issue, and the issue has stimulated significant interest within academic, political and media circles. It has been well documented that people in lower socio-economic positions generally experience worse health, higher disability, morbidity and mortality than those in a higher socioeconomic positions (Mackenbach, et al., 2003; Kunst, et al., 2005; Marmot & Wilkinson, 2006). Generally, the association between socio-economic status (SES) and health outcomes follows a gradient, whereby the higher the SES, the better the health (Adler, et al., 1994). Depression also emulates this socioeconomic gradient, and there is a

growing body of literature which demonstrates that lower SES is associated with depression (Andrade, Caraveo-Anduaga, Berglund, et al., 2000; Jo, et al., 2011; Lorant, et al., 2007; Muntaner, Eaton, Miech, & O'Campo, 2004). This correlation is reported to persist in old age, where low SES has been found to have a significant impact on late-onset depression (Huisman, Kunst, & Mackenbach, 2003; Dahl & Birkelund, 1997; Thorslund & Lundberg, 1994). Older people are thought to be particularly susceptible to the influence of SES owing to the fact that they have a greater attachment to their neighbourhood that derives from living in an area longer, spending more time day-to-day within their neighbourhood (particularly if retired or have mobility limitations), and making more use of local services compared to younger people (Stafford, Mcmunn, & DeVogli, 2011; Beard, et al., 2009; Bowling & Stafford, 2007). Studies that have employed conventional measures for SES such as level of education and household income/wealth, have illustrated that these characteristics are useful indicators in identifying the differential risks of a poor quality of life among older people, such as that of depression (Von Dem Knesebeck, Wahrendorf, Hyde, & Siegrist, 2007).

1.4.1 Education

Education is among the most important correlates of health (Jürges, 2009), and this endures in older adulthood (Zivin, et al., 2010). The effects of education on health are much stronger than that of other factors of SES, such as income/wealth and occupation (Grossman & Kaestner, 1997; Grossman, 2005), and education has been found to correlate with better health both within and across countries (Jürges, 2009). Socioeconomic disadvantage in early life has been reported to increase vulnerability to depression throughout the lifespan and into older age, through the effects of reduced opportunities for education (Fiske & Gatz, 2003). A wealth of evidence has illustrated that depressive symptoms in later life are associated with education (Cairney & Krause, 2005; Inaba, et al., 2005; Koster, Bosma, & Kempen, 2006),

some of which have reported that the impact of education on depressive symptoms is equal among men and women (Rueda, Artazcoz, & Navarro, 2008), while others detected gender differences on the impact of education on depressive symptoms, where the effect was more pronounced for women than for men (Dean, Kolody, Aartjan, & Dewey, 1992). Education, along with higher SES, has been demonstrated to act as a protective factor against the development of depressive symptoms (Blazer, 2003), where the probability of having poor mental health decreases with higher education levels (Rueda, Artazcoz, & Navarro, 2008). One theory to explain why education has such an impact on health proposes that education increases a person's ability to access and interpret information, and engenders a sense of learned effectiveness and personal control, leading to healthier life choices (Grundy & Holt, 2001), and the prevention of many illnesses and diseases. Consequently, interventions for depression in older adulthood would be most effective and amenable by targeting younger populations using educational interventions as preventative efforts. Additionally, educational interventions which target older adults at risk for depression have been illustrated to have the most empirical support to reduce negative thinking (Cole, 2008).

1.4.2 Income and Wealth

Income and wealth (used interchangeably) has also been repeatedly found to effect health outcomes in older people, where wealthier people typically report better health outcomes, health behaviours, and less depressive symptoms (McMunn, Nazroo, & Breeze, 2009; Williams, Lindquist, Sudore, Covinsky, & Walter, 2008; Jürges, 2009; Zivin, et al., 2010; Koster, Bosma, & Kempen, 2006; Marmont & Stafford, 2010). Poverty has been associated with poorer health and health outcomes, and poor access to healthcare across different countries and health care systems (Hemingway, Shipley, & Macfarlane, 2000; Marmot, Banks, & Blundell, 2003; Börsch-Supan, Brugiavini, & Jürges, 2005). Deterioration

in financial status is among the most frequently stated stressful life event reported by older adults (Fiske & Gatz, 2003). Findings suggest that older adults who report economic hardship are more likely to experience persistent depressive symptoms that are associated with low income, financial strain and exposure to unsafe environments (Mojtabail & Olfson, 2004). Furthermore, those in more economically deprived social groups exercise less help seeking behaviours, and therefore, present to medical centers and are diagnosed with disorders such as depression less frequently than those in more affluent social groups (Richards, Reid, & Watt, 2002; Gardner & Chapple, 1999). One explanation for the social gradient between income/wealth and mental wellbeing, namely depression, is based on the needs theory, which assumes that individual income as a principal indicator of economic standing augments psychological wellbeing primarily because income enables people to better provide for their needs (Diener & Biswas-Diener, 2002; Veenhoven, 1991). Cultural norms are suggested to serve as a mediating factor in the association between income and psychological well-being, and the strength of this association depends on the cultural importance of income (Diener, Suh, Lucas, & Smith, 1999). Since the stated policy aspiration throughout Europe is to have equitable provision of healthcare, policy makers and governments should concentrate their efforts on narrowing health inequalities by reducing poverty and stimulating economic viability among low SES groups. However, practical issues associated with low income such as those mentioned above (Mojtabail & Olfson, 2004), may complicate the treatment of older adults who are depressed (Arean, Gum, McColloch, Gallagher-Thompson, & Thompson, 2005).

1.5 The Role of Ageing Perceptions on Depression

As we have seen above, age has important implications for health, but there is accumulating evidence which suggests that self-perceptions of ageing also have a significant impact on

health in older adults and relates to a wide range of health outcomes, including cognitive and physical illnesses, chronic respiratory conditions, wellbeing and mortality (Levy, 2003; Levy & Myers, 2005; Levy, Slade, & Kunkel, 2002; Sneed & Whitbourne, 2005; Westerhof & Barrett, 2005). Perceptions of aging refer to the ways in which people perceive the ageing process, and by extension, experience their own transition to old age (Marmont & Stafford, 2010). Ageing perceptions and self-perceptions of ageing are formed in part by dynamic interactions with social and cultural systems that frame our understandings of age and ageing in the context of ageing populations and varying experiences of age (Demakakos, Gjonca, & Nazroo, 2007). Researchers have suggested that ageing stereotypes influence older people's self-conceptions of ageing and old age (Levy, 2003). Negative ageing perceptions, which is becoming a more important area of ageing research (Steverink, Westerhot, Bode, & Dittmann-Kohli, 2001; Fuestenburg, 2002), is an issue of particular significance given the dominance of an ageist model in western societies that considers old age as something inherently negative and which older people are subject to in their everyday lives (Westerhof & Barrett, 2005). Recent studies have shown strong associations between negative ageing perceptions and depression (Wurm & Benyamini, 2014; Lai, 2009; Levy, Pilver, & Pietrzak, 2014; Sindi, et al., 2012) and anxiety (Levy, Pilver, & Pietrzak, 2014), and until recently, no studies have yet investigated the role of negative ageing perceptions on the onset and persistence of depression and anxiety in a population of older adults. Moreover, evidence has also illustrated the significant influence of society's attitudes towards ageing on the suicide mortality of elderly people (Yur'yev et al., 2010). One account to explain the link between self-perceptions of ageing and depression is that such age-related variables reflect a self-assessment of one's own age based on a series of judgements about one's own condition. These perceptions, therefore, are expected to relate to health simply because they accurately epitomize one's health, functional, socioeconomic, and psychological status (Demakakos, Gjonca, & Nazroo, 2007).

A noteworthy assertion is that depression is not a normal stage of ageing, and attributing depression to old age has become a barrier to seeking treatment, treatment adherence, and has contributed to the reinforcement of negative ageing perceptions. The promotion of positive ageing perceptions in later life should be a key focus for governments and policy makers, and experts in the field have proposed that interventions need to target the engendering of negative ageing stereotypes at both the individual and community levels (Levy & Langer, 1994).

1.6 Impact of Depression on Health Status

Depression in late life is of acute interest and concern, since the impact on health can be particularly devastating. The link between mental wellbeing and physical health becomes more apparent with age progression, as the prevalence of chronic illnesses increases with age. While the presence of physical infirmity and comorbid medical conditions have been found to be determinants of depression in and of themselves (Kraaij, Arensman, & Spinhoven, 2002; Geerlines, Beekman, Deeg, & Van Tilurg, 1997; Prince, HArwood, Thomas, & Mann, 1998), the impact of late-life depression has been associated with the onset and progression of health problems, such as coronary heart disease, diabetes, decreased cognitive, social and physical functioning, increased disability, self-neglect, morbidity and ultimately, mortality (Blazer, 2003; Beekman, et al., 2000; Bruce, Seeman, Merrill, & Blazer, 1994; Steptoe, 2006; Penninx, Leveille, Ferrucci, van Eijk, & Guralnik, 1999; Cuijpers & Smit, 2002). Moreover, depression produces the greatest decrement in health compared with other chronic diseases, such as angina, arthritis, asthma and diabetes (Moussavi et al., 2007), and can reduce life expectancy by up to ten years due to suicide risk, and its negative impact on the incidence and course of many chronic disorders (Chesney et al., 2014; Hegerl & Mergl, 2014). There is a growing body of literature suggesting that mental wellbeing, and the absence of psychiatric disorders

such as depression, may be protective factors in reducing the risk of chronic physical illnesses and promotes longevity in later life (Steptoe, Deaton, & Stone, 2015; Lyubomirsky, King, & Diener, 2005; Chida & Steptoe, 2008). Another grim outcome of depression in the elderly is suicide, with rates of completed suicide being highest in persons aged 70 years or over in almost all regions of the world (Weaver & Koening, 1996; WHO, 2014). Furthermore, suicide and self-harm among older adults is more likely to be associated with depression than any other age group (Conwell & Brent, 1996). The predominant risk factor for suicide in late life is depression, which is present in approximately 85% of older adults who die by suicide (Conwell & Brent, 1996). For these reason, to protect the mental health and wellbeing of older adults, and also to reduce the wider economic and social burden of depression, there is an unequivocal need to screen, identify and treat depression in older adults.

1.7 Rationale of Research and Introduction to Articles

Assessing associations between depression and its determinants in older age is an important area of research in Europe, since Europe is on course for a dynamic and drastic population shift, which is expected to impact upon every level of society, including individuals, the local and wider community, health systems, and national and international economies. Despite the growing interest in epidemiographic studies on older adults, there is a dearth of literature that looks at cross-national determinants of depression in older cohorts. In addition to this, studies evaluating determinants of depression in older cohorts are limited in their representativeness, and lack standardised instruments and procedures that allows for national and international comparison. The lack of international comparative studies investigating the role of specific determinants on depression in an older population has created a research vacuum which requires explorative analysis in order to help understand the health, well-being and the economic circumstances of older people that contribute to the development and persistence of

late-life depression. With the goal of filling some of these gaps in research, the aim of the current research is to epidemiologically investigate the role of demographic and psychological variables on mental disorders in the older population, and to contribute towards epidemiological findings of depression in older adults in Europe. This aim will be achieved by addressing the following objectives: a) assessing the role of negative ageing perceptions on the onset and persistence of depression and anxiety in a population of older Irish adults and b) providing cross-population analysis of the association between components of socioeconomic status (education and income) and depression, and the association between SES as a composite score and depression across three countries in Europe.

Paper 1, Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA), is the first study to look at the role of negative ageing perceptions on the onset and persistence of depression and anxiety in a representative sample of older Irish adults. This paper comes on foot of recent studies looking at the impact of negative ageing perceptions on health outcomes in older adults, and follows a prospective design, increasing its applicability and research strength.

Paper 2, The Role of Socio-Economic Status in Depression: Results from the COURAGE (Aging survey in Europe), examines the role of two components of socioeconomic status (education and income) on depression in older adults. It also proposes a novel index, utilizing a composite score for SES, which combines two components of SES (education and income), in order to increase cross-cultural comparison utilizing a composite score for SES. This study provides a cross-sectional comparison of three European countries, which represent different regions across Europe.

From a public health perspective, it is of critical significance to advance wider epidemiological research on the association between late-life depression and its indicators in

order to inform health policy makers and governments of necessary contingencies to reduce the burden of depression and anxiety in the elderly, and thus avoid the development and exacerbation of health problems in this cohort, and limit the wider economic impact. The findings of each paper are considered in a broader context, and implications for population health, public health interventions and health research, in addition to recommendation for future directions are presented.

2. Publications

2.1 Paper 1: Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA)

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Research paper

Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA)

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abstract

Background: Although there is a growing literature on the adverse health outcomes related with nega-tive ageing perceptions, studies on their association with mental disorders such as depression and an-xiety are scarce. Thus, the aim of the current study was to prospectively assess the association between negative ageing perceptions and incident/persistent depression and anxiety using nationally re-presentative data from Ireland.

Methods: Data from two consecutive waves of the Irish Longitudinal Study on Ageing (TILDA) were analysed. The analytical sample consisted of 6095 adults aged Z50 years. Validated scales for negative ageing perceptions, depression, and anxiety were used. Multivariable logistic regression analyses were used to assess the association between negative ageing perceptions at baseline and the onset and per-sistence of depression and anxiety at two-year follow up.

Results: After adjusting for potential confounders, negative ageing perceptions at baseline predicted the new onset of depression and anxiety at follow-up. Among those with depression or anxiety at baseline, negative ageing perceptions also predicted the persistence of these conditions at follow-up.

Limitations: Baseline data on negative ageing perceptions were used for the analysis and it is possible that scores could have changed over time.

Conclusions: Addressing negative perceptions towards ageing by developing interventions that activate positive ageing perceptions, and target societal attitudes by means of policy change, public campaigns, and community education programmes, may shift social perceptions and reduce the burden of depres-sion and anxiety among the elderly.

1. Introduction

It is estimated that by the year 2050, the number of people aged 60 or older will more than double worldwide – from 841 million to over 2 billion (United Nations, 2013). This increase in the older population will inevitably be accompanied by a dispropor-tionate increase in mental disorders (World Health Organization, 2008), the implications of which will have a fundamental effect on the sustainability of health, economic, and welfare systems. Mental disorders such as depression and anxiety in late-life are major public health issues due to their high prevalence and poor outcome (Byers et al., 2010). For example, depression occurring in late-life increases the risk of suicide, impairment of physical, cognitive, and social functioning, and leads to greater self-neglect, which in turn may precipitate earlier mortality (Fiske et al., 2009). Anxiety disorders are among the most common clinical problems reported among older adults, and their detrimental effects in late-life are comparable to those of depression (Wolitzky-Taylor et al., 2010). While a myriad of studies on the determinants of depres-sion and anxiety among the elderly exist, one factor that has re-ceived little attention to date in relation to these mental health outcomes is ageing perceptions.

Self-perceptions of ageing, also referred to as ageing percep-tions or attitudes towards ageing, describe individuals' experi-ences with the ageing process and expectations about the out-come and process of getting older (Wolff et al., 2015), and play an

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important role in older adults' ageing process (Levy et al., 2002a, b). It has been postulated that throughout the course of a person's life, beliefs about ageing are formed and shaped by personal ex-periences and broader societal attitudes, and these beliefs are speculated to influence outcomes via behavioural, physiological, and psychological pathways, which may in turn affect health outcomes (Levy, 2009). In recent years, a growing body of litera-ture has documented the association between negative ageing perceptions and various health outcomes such as physical health and functioning (Wurm et al., 2007; Sargent-Cox et al., 2014; Ro-bertson and Kenny, 2015), cognitive functioning (Levy, 1996; Hess et al., 2003; Robertson and Kenny, 2015), anxiety (Levy et al., 2014), depression (Lai, 2009; Sindi et al., 2012; Wurm and Be-nyamini, 2014), and mortality (Kotter-Grühn et al., 2009).

Previous studies investigating the association between negative ageing perceptions and depression have found a positive correla-tion between the predictor and outcome. Specifically, in a large prospective study on older adults in Germany, negative ageing perceptions predicted more depressive symptoms at follow-up (Wurm and Benyamini, 2014). Furthermore, a large cross-sectional study on older Chinese adults revealed that those with a more positive attitude towards ageing reported better mental health outcomes (Lai, 2009). Finally, a Canadian cross-sectional study found that increased negative perceptions of ageing significantly increased depressive symptomatology among older adults (Sindi et al., 2012). Of these three studies that addressed depressive symptoms, only the German study was nationally representative and prospective in design, but did not focus on the persistence of symptoms. The remaining two studies were cross-sectional and were neither nationally representative, nor did they use standar-dised or validated measures to assess negative ageing perceptions (Lai, 2009; Sindi et al., 2012). In terms of anxiety, only one large cross-sectional study among U.S. veterans addressed this condi-tion, and found that negative perceptions of ageing was associated with anxiety (Levy et al., 2014). However, since this study was conducted among veterans, generalizability to the general popu-lation may be questionable. Therefore, an investigation that over-comes these limitations is necessary. In addition, studies from diverse contexts are needed as the influence of negative ageing perceptions on the health of older adults is postulated to differ across cultures and countries (Levy and Langer, 1994).

Ireland is a particularly apposite setting to study this associa-tion. For example, it is projected that by 2045, there will be more Irish citizens over the age of 65 than in the age group of 0–14 years (Długosz, 2011). Furthermore, a high prevalence of major depres-sive disorder and generalized anxiety disorder have been reported among older adults (Barry et al., 2009), while a recent study has shown that age stereotypes have become more negative in a linear way in Ireland (Reuben et al., 2015). In addition, negative ageing perceptions have been reported to be associated with various negative health outcomes in this setting (Robertson and Kenny, 2015) but there are no studies on mental health outcomes.

Thus, the aim of the current study was to assess whether ne-gative ageing perceptions predict the onset and persistence of depression and anxiety among older Irish adults. To achieve this aim, we conducted a prospective study using data from the first two waves of the Irish Longitudinal Study on Ageing (TILDA) which is a nationally representative community-based survey of the Irish older population. Based on previous literature, we hypothesised that negative ageing perceptions at baseline will predict both the onset and persistence of depression and anxiety in our sample. Determining the nature of the association between negative age-ing perceptions and mental health outcomes may help establish public health interventions to reduce the burden of mental dis-orders in the elderly.

2. Methods

2.1. Study design and sample

We analysed data from two consecutive waves of the TILDA survey conducted by Trinity College Dublin. Full details of the survey and its sampling procedure have been described elsewhere (Cronin et al., 2013; Kearney et al., 2011; Whelan and Savva, 2013; Kenny et al., 2010). In brief, this was a nationally representative population-based survey of older adults residing in Ireland. The survey was conducted between October 2009 and February 2011 for Wave 1 (W1), and between April 2012 and January 2013 for Wave 2 (W2). The target sample included all individuals residing in a household aged 50 and over. Nationally representative sam-ples were derived from clustered random sampling of all house-holds in Ireland. The baseline survey (W1) excluded participants who were institutionalised, and those with a doctor's diagnosis of dementia. In addition, those who were unable to personally pro-vide written informed consent to participate in the survey because of severe cognitive impairment (judged at the interviewer's dis-cretion) were also excluded from W1. Data collection was con-ducted by trained interviewers using Computer Assisted Personal Interviewing (CAPI), and by self-completion questionnaires (SCQs) which were returned after the interview. All participants were subject to CAPI interviews, and were also asked to complete the SCQ. The response rate of W1 was 62%, and of those who parti-cipated in the survey, 84% returned the SCQ at W1 (Kearney et al., 2011; Whelan and Savva, 2013).

W1 comprised of 8504 people aged Z50 years (n¼8175) and their spouses or partners younger than 50 years (n¼329). Of these 8504 people, follow-up data for 7207 participants were available at W2. Our analysis restricted the sample to: participants aged 50 years and above at W1; participants who returned the SCQ at W1; and those who provided information on anxiety and/or depression at W2. We used these restrictions as information on negative ageing perceptions and some other variables used in the analysis were obtained from the SCQ at W1. Furthermore, anxiety and depression were the only variables from W2 that were used in our analysis. In W2, information on anxiety and depression was ob-tained via the standard in-person CAPI interview. The sample size after restriction to these individuals was 6095, comprising 12,190 person years of follow-up. Ethical approval for TILDA was obtained by the Faculty of Health Sciences Ethics Committee of Trinity College Dublin. Written informed consent was obtained from all participants.

2.2. Measures

2.2.1. Depression and anxiety

The same method of assessment for both depression and an-xiety at W1 and W2 were employed. The scale used for depressive symptoms was the 20-item Center for Epidemiologic Studies De-pression (CES-D) (Radloff, 1977), which assesses symptoms ex-perienced in the seven days preceding the survey. The 20 items were scored on scales from 0 (rarely or none of the time, less than one day in the week) to 3 (most or all of the time, five to seven days in the week) with four items reverse coded (recoded so that all items were based on the same scale). Scores were summed to create a scale that ranged from 0 to 60, with higher scores in-dicating more depressive symptoms. The validity of the CES-D scale as a measure of depression in community-dwelling older adults has been well-documented (Hertzog et al., 1990; Lewinsohn et al., 1997). Depression was defined as a score of Z16. This cut-off point has been associated with 100% sensitivity and 88% specificity for major depression in community dwelling older adults (Beek-man et al., 1997).

Anxiety symptoms were assessed with the anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-A) (Zigmond and Snaith, 1983). The HADS-A scale measures the presence of anxiety symptoms with no specific time frame. The scale consists of seven items rated on a four-point scale from 0 (not at all) to 3 (very often indeed), with five items reverse coded. The scores of the seven items were summed to create a scale that ranged from 0 to 21, with higher scores indicating more symptoms of anxiety. The HADS-A has been found to have good sensitivity and specifi-city for assessing anxiety disorders across all ages in the general population (Bjelland et al., 2002), and among specific age groups of older adults (Spinhoven et al., 1997). Anxiety was defined as a score of Z8. This cut-off point has been associated with 89% sensitivity and 75% specificity for generalized anxiety disorder (Bjelland et al., 2002; Olsson et al., 2005).

2.2.2. Negative ageing perceptions

Negative ageing perceptions were assessed with the Brief Ageing Perceptions Questionnaire (B-APQ) (Sexton et al., 2014). The scale consists of 17 items rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree), with six items reverse coded. Scores were summed to create a scale that ranged from 17 to 85, with higher scores indicating higher levels of ne-gative ageing perceptions. The B-APQ has been psychometrically validated for use with the Irish population aged Z50, and has been found to have good internal consistency and construct va-lidity (Sexton et al., 2014). This concise version of the APQ has preserved the internal consistency and construct validity of the original, and its brevity makes it particularly suitable for use with large-scale adult population surveys. The final 17-item, 5-dimen-sion model was found to be consistent with the original con-ceptual model and fit the data well (Sexton et al., 2014). The exact 17 questions of the B-APQ can be found in Appendix 1.

2.2.3. Control variables

Sociodemographic characteristics included gender, age (50–59, 60–69, 70–79, and Z80 years), education, and employment status. Education was classified as: primary (some primary/not complete; primary or equivalent); secondary (intermediate/junior/group certificate or equivalent; leaving certificate or equivalent); and tertiary (diploma/certificate; primary degree; postgraduate/higher degree). Current employment status was categorised as: employed (employed and self-employed, including farming); retired; and unemployed (unemployed, permanently sick or disabled, looking after home or family, or in education or training).

The number of chronic medical conditions was assessed by the question “has a doctor ever told you that you have any of the conditions on this card?” Reponses included 17 conditions: high blood pressure or hypertension; angina; heart attack (including myocardial or coronary thrombosis); congestive heart failure; diabetes or high blood sugar; stroke (cerebral vascular disease); ministroke or transient ischemic attack; high cholesterol; heart murmur; abnormal heart rhythm; any other heart trouble; chronic lung disease such as chronic bronchitis or emphysema; asthma; arthritis (including osteoarthritis, or rheumatism); osteoporosis; cancer or a malignant tumour (including leukaemia or lymphoma but excluding minor skin cancers); cirrhosis or serious liver da-mage. The total number of chronic medical conditions was calcu-lated and categorised as 0 (none), 1, or Z2. Cognitive function was assessed with the Montreal Cognitive Assessment (MoCA) (score range 0–30). This tool has been validated in the older Irish popu-lation (Kenny et al., 2013), and includes measures of executive function, language, memory, attention, orientation, calculation and visuospatial ability. Cognitive impairment was defined as a MoCA scoreo26 (Freitas et al., 2013). Difficulties with six types of acti-vites of daily living (ADL) [dressing, walking, bathing, eating, getting in or out of bed, and using the toilet (Katz et al., 1963)] were assessed by asking participants to indicate whether they had difficulty performing these activities. ADL disability was defined as having difficulty with at least one of these ADLs.

2.3. Statistical analysis

Analysis was done with Stata version 13.1 (Stata Corp LP, Col-lege Station, Texas). A descriptive analysis was conducted to de-monstrate the baseline sample characteristics. These analyses in-cluded unweighted frequencies, means, and standard deviations. The mean (SD) of the negative ageing perception scale was cal-culated by each sample characteristic at baseline. The difference between each sample characteristic in terms of the negative age-ing perception scale was tested with Student's t-tests and one-way ANOVA for variables with two and Z3 categories respectively.

Multivariable logistic regression analysis was used to assess the associations between negative ageing perception and depression or anxiety. Negative ageing perception (exposure variable) was based on data collected at W1. The four outcomes were incident depression, incident anxiety, persistent depression, and persistent anxiety. Incident depression and anxiety were assessed among those without depression or anxiety respectively at baseline (W1), and referred to new cases of depression or anxiety at W2 (out-come). Thus, those with depression at baseline were omitted from the analysis on incident depression, and similarly, those with an-xiety at W1 were excluded from the analysis on incident anxiety. On the other hand, persistent depression and anxiety were eval-uated only among those who had depression or anxiety at W1 respectively, and were defined as the presence of depression or anxiety at W2. The models were adjusted for sex, age, education, employment status, number of chronic medical conditions, ADL disability, and cognitive impairment based on information ob-tained at W1. The selection of control variables was based on past literature (Levy et al., 2002a,b; Djernes, 2006; Lai, 2009; Vink et al., 2008; Chachamovich et al., 2008; Byers et al., 2010; Han and Richardson, 2015). With the exception of the negative ageing perception scale, all variables were included in the models as ca-tegorical variables. Since information on cognition was missing for approximately one fifth of the participants, we included a missing category for this variable in the models in order to retain as many participants as possible in the analysis. Furthermore, in order to assess whether the association between negative ageing percep-tions and the mental health outcomes differs by age, we tested for effect modification by age group (50–59, 60–69, 70–79, 80þ years) by including the product term age group X negative ageing per-ception in the models. Sampling weights were generated with respect to age, sex, and educational attainment to the Quarterly National Household Survey 2010. In all analyses, the sample weighting and the complex study design including clustering within households were taken into account to obtain nationally representative estimates using the Stata svy command. Results are expressed as odds ratios (ORs) and 95% confidence intervals (95% CIs). A p-valueo0.05 was considered to be statistically significant.

3. Results

The average age (SD) of the analytical sample (n¼6095) was 63.3 (9.0) years, and 51.7% were females. The prevalence (n) of depression and anxiety at baseline were 9.8% (532) and 24.9% (1418) respectively. The sample characteristics and their associa-tion with negative ageing perceptions are presented in Table 1. Male sex, older age, lower education, higher number of chronic medical conditions, ADL disability, cognitive impairment, depres-sion, and anxiety were associated with higher mean scores on the

Table 1
Baseline characteristics of the study sample.

Characteristic	Category	N	Negative ageing perceptions[a] Mean (SD)	P-value[b]
Sex	Female	3320	40.8 (8.9)	o0.001
	Male	2775	41.7 (7.7)	
Age (years)	50–59	2483	39.5 (7.8)	o0.001
	60–69	2010	40.6 (8.4)	
	70–79	1217	44.5 (7.6)	
	80þ	385	47.7 (6.5)	
Education[c]	Primary	1604	44.0 (7.0)	o0.001
	Secondary	2517	40.4 (7.6)	
	Tertiary	1966	38.9 (10.2)	
Employment status[d]	Employed	2281	39.0 (7.7)	o0.001
	Retired	2251	43.0 (8.5)	
	Unemployed	1484	42.5 (8.0)	
Chronic medical conditions[e]	None	1425	39.5 (7.9)	o0.001
	One	1723	40.2 (8.0)	
	Two or more	2947	42.8 (8.3)	
ADL disability[f]	No	5609	40.8 (8.2)	o0.001
	Yes	486	46.3 (7.7)	
Cognitive impairment[g]	No	2491	39.2 (8.2)	o0.001
	Yes	2445	42.5 (7.9)	
Depression[h]	No	5481	40.7 (8.1)	o0.001
	Yes	532	46.7 (8.1)	
Anxiety[i]	No	4461	39.9 (7.9)	o0.001
	Yes	1418	45.1 (7.9)	

Abbreviation: ADL – Activities of Daily Living.
All estimates are based on weighted data.

[a] Negative ageing perceptions were based on a scale ranging from 17 to 85 with higher scores indicating higher levels of negative ageing perception.

[b] The difference between each sample characteristic in terms of the negative ageing perception scale was tested with Student's t-tests and one-way ANOVA for variables with two and Z3 categories respectively.

[c] Primary Education refers to having completed primary level education, or lower; Secondary Education refers to having completed intermediate or leaving certificate examinations; Tertiary Education refers to having completed a diploma, primary, or higher degree.

[d] Employed (employed and self-employed, including farming); Unemployed (unemployed, permanently sick or disabled, looking after home or family, or in education or training).

[e] Seventeen types of chronic medical conditions were assessed.

[f] ADL disability was defined as having difficulty with at least one of the fol-lowing ADLs: dressing, walking, bathing, eating, getting in or out of bed, and using the toilet.

[g] Cognitive impairment was assessed with the Montreal Cognitive Assessment (MoCA) and referred to a score o26.

[h] Depression was assessed using the Center for Epidemiologic Studies De-pression (CED-S) scale and scores ranged from 0 to 60, with the cut off for de-pression being Z16.

[i] Anxiety was assessed using the anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-A) which is based on a scale from 0 to 21 with the cut off for anxiety being Z8.

negative ageing perception scale. The association between nega-tive ageing perception and incident or persistent depression and anxiety adjusted for gender, age, education, occupation, chronic medical diseases, disability, and cognitive impairment, estimated by logistic regression is illustrated in Table 2.

3.1. Incidence of depression and anxiety at follow-up

At two-year follow-up, there were 265 and 165 new cases of incident depression and anxiety respectively. The presence of ne-gative ageing perceptions at baseline predicted the onset of de-pression and anxiety at follow-up. Specifically, among those with no depression at baseline, individuals with a higher negative perception of ageing at W1 were significantly more likely develop depression at follow up (OR 1.09, 95%CI¼1.06–1.11). This OR can be interpreted as the change in the odds of incident depression associated with a one-point increase on the negative ageing per-ception scale (range 17–85) at baseline. The corresponding figure for anxiety (among those with no anxiety at baseline) was OR 1.04 (95%CI¼1.01–1.07).

3.2. Persistence of depression and anxiety at follow-up

Of those who had depression or anxiety at baseline, 50.0% and 35.2% continued to have these conditions at two-year follow-up respectively. Among those who had depression at baseline, higher levels of negative ageing perception at baseline predicted the persistence of depression at follow-up (OR 1.05; 95%CI¼1.02– 1.07). The corresponding figure for anxiety (among those who had anxiety at baseline) was OR 1.04 (95%CI¼1.02–1.05).

There were no significant interactions between negative ageing perceptions and anxiety/depression by age group in any of the regression analyses, implying that the effect of negative ageing perceptions on mental health is consistent across age groups.

4. Discussion

The current study showed that higher levels of negative ageing perceptions at initial assessment were a significant predictor of the onset and persistence of both depression and anxiety at fol-low-up after adjustment for potential confounders. To the best of our knowledge, this is the first study on negative ageing percep-tions and mental disorders among older Irish adults, and also the first to assess the association between negative ageing perceptions and the persistence of depression and anxiety. The strengths of the study include the large sample size, prospective design, and the use of nationally representative data. Furthermore, we used vali-dated scales for negative ageing perceptions, depression, and an-xiety, which have rarely been used collectively in studies on this topic.

Several study limitations should be borne in mind before the findings are discussed. First, since all data including depression and anxiety were obtained using self-reported measures, report-ing-bias may be present. Second, baseline data on negative ageing perceptions and other control variables were used for the analysis. Consequently, it is possible that some conditions or characteristics of the respondents changed between the two waves. Third, the variable on depression was based on symptoms in the past seven days. Using different time frames may have yielded different re-sults. The results may have also differed if clinical assessments for depression and anxiety were performed. Additionally, factors such as personality traits that could underlie both negative ageing perceptions and proneness to depression (Moor et al., 2006) were not taken into account in the analysis due to lack of data. Next, those who were not followed at W2 were more likely to have been older, unemployed, and of lower education at baseline. Thus, some degree of bias might have been introduced due to loss to follow-up. Finally, the W1 survey response rate was relatively low (62%). However, other epidemiological studies have found that poor re-sponse rates have a minimal effect on the risk estimates and in the identification of risk factors of psychiatric disorders (Batty and Gale, 2009; Bergman et al., 2010).

Our results on depression and anxiety are in line with the four previous studies on this topic (Wurm and Benyamini, 2014; Lai, 2009; Sindi et al., 2012; Levy et al., 2014). To date, the interplay of factors that contribute towards depression and anxiety in older adults have been established (Cole and Dendukuri, 2003; Vink et al., 2008). However, the mechanisms that link negative ageing perceptions with common mental disorders in the elderly remain unclear (Sargent-Cox et al., 2014). Nevertheless, several mechan-isms may explain this association. First, people who have negative

Table 2
The association between negative ageing perceptions and incident or persistent depression and anxiety.

		Incident		Persistent	
		Depression	Anxiety	Depression	Anxiety
Negative ageing perceptions[a]		1.09*** [1.06,1.11]	1.04* [1.01,1.07]	1.05** [1.02,1.07]	1.04*** [1.02,1.05]
Sex	Female	1.00	1.00	1.00	1.00
	Male	0.53*** [0.39,0.73]	0.52** [0.33,0.81]	0.92 [0.57,1.49]	0.60*** [0.45,0.80]
Age (years)	50–59	1.00	1.00	1.00	1.00
	60–69	0.41*** [0.27,0.62]	0.35*** [0.20,0.61]	0.56 [0.31,1.01]	0.60** [0.44,0.82]
	70–79	0.26*** [0.16,0.43]	0.37** [0.19,0.72]	0.77 [0.37,1.59]	0.38*** [0.23,0.63]
	80þ	0.29*** [0.14,0.60]	0.23** [0.09,0.64]	0.36 [0.09,1.47]	0.36* [0.15,0.89]
Education[b]	Primary	1.00	1.00	1.00	1.00
	Secondary	0.79 [0.53,1.18]	1.04 [0.62,1.73]	0.79 [0.47,1.32]	0.69* [0.50,0.95]
	Tertiary	0.86 [0.56,1.32]	0.94 [0.53,1.69]	0.72 [0.38,1.35]	0.79 [0.54,1.15]
Employment status[c]	Employed	1.00	1.00	1.00	1.00
	Retired	1.27 [0.85,1.91]	1.48 [0.82,2.68]	1.27 [0.64,2.53]	1.11 [0.73,1.67]
	Unemployed	0.94 [0.61,1.46]	1.96** [1.18,3.28]	1.64 [0.93,2.87]	1.15 [0.81,1.63]
Chronic medical conditions[d]	None	1.00	1.00	1.00	1.00
	One	1.23 [0.77,1.98]	1.01 [0.57,1.78]	1.55 [0.75,3.20]	1.73** [1.19,2.50]
	Two or more	1.64* [1.10,2.43]	1.52 [0.93,2.49]	1.38 [0.73,2.61]	1.64** [1.15,2.34]
ADL disability[e]	No	1.00	1.00	1.00	1.00
	Yes	1.32 [0.79,2.22]	1.12 [0.58,2.16]	1.46 [0.85,2.48]	1.61* [1.01,2.54]
Cognitive impairment[f]	No	1.00	1.00	1.00	1.00
	Yes	1.00 [0.70,1.43]	1.42 [0.94,2.14]	0.96 [0.56,1.65]	0.82 [0.60,1.11]

Abbreviation: ADL – Activities of Daily Living.
Data are odds ratio [95% Confidence Intervals]. Models are adjusted for all covariates in the table.

[a] Negative ageing perceptions were based on a scale ranging from 17 to 85 with higher scores indicating higher levels of negative ageing perception.

[b] Primary Education refers to having completed primary level education, or lower; Secondary Education refers to having completed intermediate or leaving certificate examinations; Tertiary Education refers to having completed a diploma, primary, or higher degree.

[c] Employed (employed and self-employed, including farming); and Unemployed (unemployed, permanently sick or disabled, looking after home or family, or in edu-cation or training).

[d] Seventeen types of chronic medical conditions were assessed.

[e] ADL disability was defined as having difficulty with at least one of the following ADLs: dressing, walking, bathing, eating, getting in or out of bed, and using the toilet.

[f] Cognitive impairment was assessed with the Montreal Cognitive Assessment (MoCA) and referred to a score o26.

* po0.05.

** po0.01.

*** po0.001.

ageing perceptions might have a more negative outlook of the future, and expect to experience difficulties in their daily lives and relationships as they age, which may subsequently manifest as stress, depression, and anxiety. In the B-APQ, this mentality may be reflected in questions such as “I get depressed when I think about how ageing might affect the things that I can do” or “I worry about the effects that getting older may have on my relationships with others”. These ideas when compounded by the perceptions of low control of the ageing process, or a perception that the future cannot provide a prospect of better health, may have a more detrimental effect on mental health. Indeed, previous studies have shown that perceived control or optimism of the future are in-fluential factors in the association between self-perceptions of ageing and various negative health outcomes including depression (Levy et al., 2002a,b; Wurm and Benyamini, 2014). Second, nega-tive ageing perceptions may lead to more rapid decline in health due to less health care-seeking and engagement in preventative and health-promoting activities (Levy and Myers, 2004). Leventhal and Prohaska (1986) postulated that negative perceptions of ageing could increase the chance that a person would attribute deteriorating health to old age, and therefore delay help seeking. This may also explain why negative ageing perceptions were linked to persistence of depression and anxiety in our study. It may be that those with negative ageing perceptions are less likely to seek health care for depression/anxiety because they believe that mental ill-health is part of the normal ageing process (Sar-kisian et al., 2002).

Thirdly, the exposure, and subsequent processing and inter-pretation of negative ageing stereotypes by older adults may act as environmental stressors, which are inextricably linked with psy-chiatric conditions (Rozanov and Carli, 2012). The stress vulner-ability model posits that those with less exposure to environ-mental stressors are less likely to experience a variety of psy-chiatric conditions compared to those who are more exposed (Royanov and Carli, 2012). Experimental studies on negative age-ing stereotypes have illustrated that older adults experience ne-gative ageing stereotypes as environmental stressors, which in-creases their vulnerability to depression and other psychiatric

conditions (Levy et al., 2014). Additionally, the action of inter-nalizing ageing stereotypes into constructs of one's self-percep-tions on ageing has been postulated to result in a "self-fulfilling prophecy" of the stereotype (e.g., I will be depressed when I'm old) (Levy et al., 2002a). Finally, factors such as internalisation/stereo-type embodiment, downward social comparison/resilience, and upward social comparison/role models may also be implicated in the association between negative ageing perception and mental health outcomes (Butzer and Kuiper, 2006; Bennett and Gaines, 2010; Quinn et al., 2014; Min et al., 2015; Dionigi, 2015).

Our findings provide further evidence of the potential role of negative ageing perceptions on poor health outcomes, and support actions to counteract the deleterious effects of negative ageing perceptions in order to prevent mental disorders among the el-derly, and to promote successful ageing. Studies have illustrated that positive and negative ageing perceptions can be modified under experimental conditions (Levy, 1996). Priming stereotypes of ageing has been shown to have reliable influences on various aspects of older adults' functioning including cognition, behaviour, and physiology (Levy, 2003). For example, activating positive ageing stereotypes by using words such as wise, sage, and alert, has been reported to improve participants' performance on var-ious memory tasks (Abrams et al., 2008, 2006). In a similar fash-ion, the activation of negative ageing stereotypes has been found to reduce the levels of subjective health and extraversion, and to increase feelings of loneliness (Coudin and Alexopoulos, 2010). Therefore, it may be beneficial to develop interventions that can activate and sustain positive ageing perceptions.

Levy and Langer (1994) have proposed that interventions should occur at both individual and community levels. At an in-dividual level, Scholl and Sabat (2008) argue that older individuals should maintain their sense of perceived control, which can be achieved by giving them autonomy over personal decisions re-garding their health. Additionally, the importance of promotion of optimism and positive emotions has been pointed out (Wurm and Benyamini, 2014). At a community-level, since negative ageing stereotypes are entrenched from an early age and older people's attitudes towards ageing is considered to be a reflection of societal attitude (Levy, 2009), interventions should be developed to target societal beliefs. Community education programmes and cam-paigns that foster understanding and respect between younger and older generations can also work towards shifting social per-ceptions towards ageing (Chase, 2005). Furthermore, in terms of structural or policy level interventions, societal planning for the engagement and involvement of older people and challenging of societal attitudes towards ageing are central to creating and sus-taining positive ageing perceptions. Practical policy interventions, such as making reforms to the pension system and Equity Bill, which have already been put forward by the English government (Department for Work and Pensions, 2009), would outlaw un-justifiable age discrimination and facilitate continued engagement in society, thus fostering positive attitudes towards ageing. Further to this, supporting continued working of older citizens by chan-ging the default retirement age for pensioners may counteract out-dated stereotypes and assumptions about ageing and help shift attitudes and expectations of ageing across the whole society.

In conclusion, our study demonstrated that negative ageing perceptions predict the onset and persistence of depression and anxiety in older adults. Our findings suggest that addressing atti-tudes towards ageing may help reduce the burden of depression and anxiety among the elderly. Given that negative ageing per-ceptions are linked with a variety of health outcomes, addressing negative ageing perceptions and stereotypes may have a multi-outcome benefit. Intervention studies assessing the impact of ad-dressing negative ageing perceptions on mental health, and its parallel impact on other health outcomes are warranted. Moreover, future studies that assess how different dimensions of negative ageing perceptions predict adverse health outcomes may be important to understand the underlying mechanisms.

Appendix 1

Questions included in the Brief Ageing Perceptions Ques-tionnaire (B-APQ):

1. I always classify myself as old.
2. I am always aware of the fact that I am getting older.
3. I feel my age in everything that I do.
4. As I get older I get wiser.
5. As I get older I continue to grow as a person.
6. As I get older I appreciate things more.
7. I get depressed when I think about how ageing might affect the things that I can do.
8. The quality of my social life in later years depends on me.
9. The quality of my relationships with others in later life depends on me.
10. Whether I continue living life to the full depends on me.
11. Getting older makes me less independent.
12. As I get older I can take part in fewer activities.
13. As I get older I do not cope as well with problems that arise.
14. Slowing down with age is not something I can control.
15. I have no control over the effects which getting older has on my social life.
16. I worry about the effects that getting older may have on my relationships with others.
17. I feel angry when I think about getting older.

* Answer options were: "Strongly disagree", "Disagree", "Neither agree nor disagree", "Agree", and "Strongly agree".

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2.2. Paper 2: The Role of Socio-Economic Status in Depression: Results from the COURAGE (Aging survey in Europe)

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The role of socio-economic status in depression: results from the COURAGE (aging survey in Europe)

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Abstract

Background: Low socio-economic status (SES) has been found to be associated with a higher prevalence of depression. However, studies that have investigated this association have been limited in their national scope, have analyzed different components of SES separately, and have not used standardized definitions or measurements across populations. The aim of the current study was to evaluate the association between SES and depression across three European countries that represent different regions across Europe, using standardized procedures and measurements and a composite score for SES.

Method: Nationally-representative data on 10,800 individuals aged ≥18 from the Collaborative Research on Ageing in Europe (COURAGE) survey conducted in Finland, Poland and Spain were analyzed in this cross-sectional study. An adapted version of the Composite International Diagnostic Interview was used to identify the presence of depression, and SES was computed by using the combined scores of the total number of years educated (0–22) and the quintiles of the country-specific income level of the household (1–5). Multivariable logistic regression was used to assess the association between SES and depression.

Results: Findings reveal a significant association between depression and SES across all countries ($p \leq 0.001$). After adjusting for confounders, the odds of depression were significantly decreased for every unit increase in the SES index for Finland, Poland and Spain. Additionally, higher education significantly decreased the odds for depression in each country, but income did not.

Conclusion: The SES index seems to predict depression symptomatology across European countries. Taking SES into account may be an important factor in the development of depression prevention strategies across Europe.

Keywords: Depression, Socioeconomic status, Cross-national, Income, Education

Background

Depression is a significant public health issue which transcends communities and countries. It is the leading cause of disability worldwide, and the global burden of depression is on the rise [1, 2]. The prevalence of depression varies considerably both within and between countries across Europe [3, 4], which may be a reflection of the role of contextual factors, such as economic, demographic and environmental factors on the develop-ment and prevalence of depression [5–9]. Beset by grow-ing national and international inequalities in income, education and wealth, socioeconomic status (SES) has come into focus as a crucial determinant of depression [10]. The role of SES in depression is an important theme, and there is a large body of literature which illustrates the negative association between SES and depression [11–13] where according to Lorant and colleagues, low SES-individuals have higher odds of being depressed [14].

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To date, many studies have evaluated the role of SES on depression, using individual levels of stratification related to income, education, occupation, social class, or wealth [10, 13–17]. However, despite this, there is a dearth of research that uses standardized measures or definitions for SES, or that compare this association between countries of different socio-economic and cultural contexts using such measures. The Collabora-tive Research on Ageing in Europe (COURAGE), from which our data was derived, is among the few large population-based nationally-representative health studies that apply standardized designs and procedures across all survey populations. The countries included in the COURAGE survey were deliberately chosen to represent different cultural and economic statuses in Europe.

As yet, there has been no "gold standard" put forward for measuring SES, and as such, due to variation in meas-urement techniques, the transferability and comparability of existing findings are limited. Traditionally, the measure-ment of SES can encompass several different indicators, which often results in gradients of varying slopes [18]. Moreover, the numerous interchangeable terms used to describe SES create complexity in interpreting findings. Using standardized measurements and definitions for SES allows for comparison, particularly between different countries, and ensures that the same component is being measured. This is important particularly for good research practice, and for clinical application.

In addition to this, the majority of the studies investi-gating this association are not representative of an entire population or country, nor have previous studies focused collectively on the current countries in question. More-over, in epidemiological studies investigating the rela-tionship between depression and measures of SES, standardized measurements or definitions for SES and depression were lacking.

Given the increasing burden of depression globally [6], the deepening challenge of income inequality [19], as well as the lack of global evidence on the association between depression and SES among cross-country popu-lations using systematic measures, the aim of the present study was to evaluate and compare the association be-tween SES (as a composite score), education and income with depression in three model European countries.

Methods

Design

The COURAGE was a cross-sectional, general popula-tion survey of non-institutionalized adults (aged ≥18 years), conducted in Finland, Poland and Spain between 2011 and 2012 (n = 10,800 individuals: Finland 1976; Poland 4071; and Spain 4753). These countries were selected to give a broad representation across different European regions, representing the north, the east and the south of Europe respectively, and taking into consideration their populations, health and welfare characteristics (median age, life expectancy and sex ratio) [20]. In Poland and Spain, a stratified multistage clustered design was used using strata according to geographical administrative and catchment area sizes. Municipalities and census units were systematically selected with probabilities proportional to the popula-tion size. Age strata were used to select households, and individuals were randomly selected from inhabitants in a certain age group within the household. In Finland, a two-stage clustered sampling design was used and strata were created based on the largest towns and university hospital regions. Systematic sampling was conducted so that the sample size in each stratum was proportional to the base population. The differences in socio-economic gradients between Finland, Poland, and Spain provide opportunities to compare the effects of social security mechanisms and aging outcomes. The individual response rates were 53.4, 66.5 and 69.9 %, in Finland, Poland and Spain respectively. Sampling weights were generated to account for the complex study design in each country. Post-stratification corrections were made to the weights to adjust for the population distribution obtained from the national census from each country.

Information was gathered through household inter-views, where interviews were conducted face-to-face by Computer-Assisted Personal Interviewing (CAPI). All the interviewers participated in a training course for the ad-ministration of the survey. Quality control procedures were implemented during fieldwork [17]. The instruments were translated from English into Finnish, Polish, and Spanish following the World Health Organization (WHO) translation guidelines for assessment instruments, which included a forward translation, a targeted back-translation, review by a bilingual expert group and a detailed transla-tion report [21]. These three countries followed this same systematic methodology and utilized the same standard-ized questionnaire to collect information on health and well-being among non-institutionalized adult populations. Further details of the survey can be found elsewhere [22].

Depression

An adapted version of the Composite International Diagnostic Interview (CIDI 3.0) was used to assess the presence of depression in the previous 12 months [23]. Depression was confirmed if a certain number of symp-toms of depression were endorsed by the respondent, as calculated by an algorithm based on the DSM-IV for Major Depressive Disorder [24].

Socio-demographic and lifestyle characteristics

Participants were asked to provide various socio-demographic information (e.g. age and sex). Marital

status was categorized as single/never married; married/ co-habiting; or divorced/widowed. Country-wise quin-tiles of household income before tax were calculated asking the specific question ¨ which categorization best represents the total personal earnings income of all fam-ily members (including yourself) in the past 12 months, before taxes? (Count only wages and other stipends from their employment, not pensions, investments, or other income)¨. Next the household income variable was cor-rected with the use of household income by social secur-ity retirement benefits, by any income from government assistance programs and other sources (i.e., pensions, in-vestments, child support or alimony). The 1st quintile and the 5th quintile represented the lowest and the highest level of wealth respectively. Education was based on the total number of years of education received, with 0 being the minimum and 22 the maximum.

Socio-economic status

The indicators education and income have been chosen as components of the SES index as they have strong the-oretical associations with depression [18, 25–30]. The use of years educated and income level as components of the SES index is also supported as they are more applicable to modern society, are based mainly on numerical, self-report data, and are easy to obtain. The omission of occupation based measures can be justified because it is not applicable to people who are currently unemployed (students, jobless individuals, retired people, stay-at-home mothers, etc.), many occupational based measures are outdated [31] and also because oc-cupation may have different meanings for different birth cohorts and in different geographical settings (which may make international comparisons problematic) [18]. Based on existing literature [32–36], a composite score for SES, using the determinants of education and income, was generated. Education and income included in the same model may lead to biased estimates due to collinearity, therefore, the composite score was gener-ated in order to counteract this. The composite score of SES was computed by using the total number of years educated (0–22) and the quintiles of the country-specific income level of the household (1–5). Education level and household income level in multi-adjusted models could also be independently added. However, this analysis would raise co-linearity issues, which influences the robustness of the model's estimates. In order to pro-vide an accurate estimate of respondents' SES, these two variables were multiplied to create combined scores ranging from 0 to 110.

Statistical analysis

Data was available on 10,800 participants (Finland, 18 %; Poland, 38 %; Spain 44 %). Country-wise analyses were conducted to account for the heterogeneity between countries. The baseline characteristics were compared between depressed and non-depressed. Continuous variables (SES index) was presented as mean ± SD, and categorical variables as percentages. Chi square tests were used to test the association between depressed and non-depressed for each variable. Logistic regression analyses with multiple variables were conducted to assess the association between education, income or SES index (independent variable) and depression (dependent variable) for the individual countries. All models were adjusted for age, sex, and marital status. The results illustrating education and income included in the models individually have been presented in order to enhance our knowledge of those aspects of SES that are critical for depression, and also to facilitate comparisons with existing studies. The sample weighting and the complex study design were taken into account in all analyses to generate nationally-representative estimates. Results from regression models are presented as odds ratios and 95 % Confidence Intervals (CIs). All reported p-values were based on two-sided test, where the level of statistical significance was set at $p < 0.05$. SPSS software, version 19 was used for all statistical calculations (SPSS Inc., Chicago IL, USA).

Results

The analytical sample size was 10,800 (Finland, 1976; Poland, 4071; Spain, 4753). The mean age ± SD in Finland was 50 ± 0.43, 46 ± 0.42 in Poland, and 48 ± 0.33 in Spain. The prevalence of depression was 4 % in Finland and Poland, and 9 % in Spain ($p \leq 0.001$), where females had a significantly higher prevalence of depression than males in each country (≤0.001). In terms of age groups, Finland had a higher proportion of the younger age group who were categorized as depressed, and Spain had a higher proportion of the older age group who were categorized as depressed ($p \leq 0.001$).

Table 1 presents the association between sociodemo-graphic characteristics by depression status and by coun-try. Table 1 also illustrates significant differences between depressed and non-depressed people for age, marital status, education, and income. Most noteworthy for the current study, findings reveal a significant association between depressed and non-depressed people for SES across all countries.

Logistic regression analyses were conducted to assess the association between indices of SES (education, Model 1; and income, Model 2) and the index for SES (Model 3), with depression as the outcome (see Table 2). After adjust-ing for the various confounders (sex, age, and marital status) the logistic regression models illustrated that for all countries (Finland, Poland and Spain), the odds of depres-sion were significantly decreased for every unit increase in

Table 1 Demographic characteristics of the COURAGE study sample, stratified by depression status, and by country

	Finland (%)			Poland (%)			Spain (%)		
	Depressed (n = 80)	Non-Depressed (n = 1854)	p	Depressed (n = 214)	Non-Depressed (n = 3726)	p	Depressed (n = 510)	Non-Depressed (n = 4073)	p
Sex									
Male	21.1	49.2	≤0.001	36.2	48.0	0.054	31.0	51.1	≤ 0.001
Age Group			0.21			0.04			≤0.0001
18–39	41.8	32.1		26.7	42.0		21.8	38.2	
40–64	42.1	45.2		50.0	40.9		50.1	41.9	
65+	16.1	22.7		23.3	17.1		28.1	19.9	
Marital Status			≤ 0.001			0.004			≤ 0.001
Single	31	25		23	17		21	28	
Married/Cohabiting	38	60		49	65		45	58	
Divorced/Widowed	31	15		28	13		34	14	
No. Yrs Education									
mean ± SD	12.09 ± 3.8	12.2 ± 4.1	0.819	11.05 ± 3.9	11.75 ± 3.7	0.009	8.27 ± 5.7	10.9 ± 5.6	≤ 0.001
Income Quintiles			≤ 0.001			0.004			≤ 0.001
1 (Poorest)	25.2	22.6		38.2	22.9		12.4	23.5	
2 (Poorer)	31.3	15.2		18.1	13.7		32.5	14.7	
3 (Middle)	19.3	18.1		11.1	13.8		24.2	19.6	
4 (Rich)	14.9	27.9		10.8	22.3		18.2	23.3	
5 (Richest)	9.2	16.2		21.9	27.2		12.7	18.9	
SES Index									
(0–110)	31.9 ± 22.0	38.7 ± 25.5	≤ 0.02	27.4 ± 23.6	34.9 ± 24.2	≤ 0.001	23.3 ± 21.5	32.6 ± 26.2	≤ 0.001

the SES index (OR 0.99, 95 % CI 0.98–0.99; OR 0.98, 95 % CI = 0.975–0.99, OR 0.99, 95 % CI 0.984–0.99, respectively). Income was found to be a significant predictor of depres-sion in Finland and Poland, but not in Spain.

Concerning the correlation of SES components by country analysis, a positive correlation was observed between education and income in Finland (rho = 0.45, p < 0.01), Poland (rho = 0.31, p < 0.01) and Spain (rho = 0.17, p < 0.01).

Discussion

Our findings illustrate that for each country, higher education and a higher SES index score act as protective factors against depression. A higher income was

Table 2 Results from the multivariable logistic regression analysis on the association between indices of socio-economic status on depression by country

		Model 1		Model 2		Model 3	
		OR	95 % CI	OR	95 % CI	OR	95 % CI
Depression Finland	Yrs of Education	0.94	0.89–0.985				
	Income (Quintile)			0.84	0.714–0.987		
	SES Index (0–110)					0.991	0.98–0.997
Depression Poland	Yrs of Education	0.934	0.88–0.983				
	Income (Quintile)			0.84	0.71–0.98		
	SES Index (0–110)					0.986	0.975–0.99
Depression Spain	Yrs of Education	0.913	0.887–0.939				
	Income (Quintile)			1.0	0.914–1.09		
	SES Index (0–110)					0.989	0.984–0.995

Model 1 includes years educated, and was adjusted for sex, age, and marital status. Model 2 includes income quintiles, and was also adjusted for sex, age and marital status. Model 3 includes SES index, and was also adjusted for sex, age and marital status

associated with lower odds of having depression in Finland and Poland, but not in Spain. To the best of our knowledge, this is the first multi-national European study that has evaluated the association between SES as a concrete index and depression, using nationally-representative data from three countries using standard-ized instruments. This allowed for a comparison be-tween the different settings (Spain, Finland and Poland), which has not been done previously.

The findings from the current study, which illustrates the impact that a higher SES has on preventing depres-sion, reinforces findings from previous studies. Results from a meta-analysis on socioeconomic inequalities in depression conducted by Lorant and colleagues [29] revealed conclusively that low SES individuals had higher odds of being depressed. This study also found that for each additional year of education, the odds of being depressed decreased by 3 % and a 1 % increase in the income ranking led to a 0.74 decrease in the log odds of being depressed [29]. Additionally, the correl-ation between income and education which was found across all countries in the current study support previ-ous studies of European regions which found that high levels of educational attainment were found to be signifi-cantly and robustly associated with higher income [37].

The findings which outline that education has a role in the prevalence of depression supports previous find-ings from an epidemiological study of major depressive disorder (MDD), which illustrated an inverse association between the prevalence of MDD and level of education [38]. Additionally, a large prospective study demon-strated that lower education was associated with an increased risk of depression at follow-up [20]. In the European context, a Norwegian cross-sectional study on adults found that low education levels ware significantly associated with depression [39]. This association was consistent across all the countries in the current study. In terms of income, our findings demonstrated that higher income quintiles were associated with depression, however only in Finland and Poland. Other European studies also found that personal economy was strongly and independently associated with depression [40, 41].

Additionally, our results support the use of the SES index as a composite score for SES, using both years in education and income level [32–36]. These two indica-tors are supported as components for the SES index as they have a strong theoretical association with depres-sion, and the data was easily obtained and applicable to our study sample [25–29]. The multiple-indicator approach to establish SES has the advantage of providing more information and greater flexibility [33–36]. The current findings contribute to existing research in depression, illustrating that depression and low SES are inextricably linked, but it also builds upon previous research by having demonstrated that a composite score of SES based on two components of SES (education and income) can in fact predict depression symptomatology reliably across three countries.

An explanation for why higher income quintiles were not associated with depression in Spain can be postu-lated when considering the context of the countries at the time of data collection. At the time of the data collection, the prevalence of depression in Spain (9 %) was found to be more than double the rate of depression compared to both Finland (4 %) and Poland (4 %). This discrepancy in rates of depression can be attributed to a number of factors. Firstly, at the time of data collection, Spain was embroiled in a financial crisis, where un-employment was at a record high, exceeding 20 % [42]. For this same period, the unemployment rate in Poland and Finland were both under 10 % [43, 44]. In light of the fact that there were no methodological differences between the countries in the study design, instruments or definitions used, the discrepancy in the prevalence of depression may also be attributed to cultural differences. Such cultural variances may involve the willingness to report, the differences in the amount of stigma attached to depression between the countries (which would influence the reliability of the self-report measure due to self-presentation biases), and different environmental stressors (e.g. urbanization) [45–47]. Further research on under-standing the cross-cultural differences in depression is needed in order to examine how these factors interact with each other and influence the prevalence rates.

By reason of the culture explanation, this may also be a valid explanation as to why a lower income was not found to be associated with depression in Spain. Perhaps that for Spanish people, income is not the main protect-ive factor against depression, and the likes of good social networks [48], sunlight [49] and diet [50] may all be important protective factors against depression in Spain. The interpretation of the current evidence is complex, however, and the findings that a lower SES is associated with depression can be interpreted differently in each of the settings, as the effect of SES on depression may not be due to the same reason in all settings. For instance, living conditions, lifestyle choices, health and welfare characteristics and culture may contribute to the vari-ability in the prevalence of depression. For example, Spain has limited mental health coverage compared to most other European countries, and therefore may account for the higher rates of depression compared to Poland and Finland. One explanation for the finding that lower income was not associated with depression in Spain may be that because 80 % of depression patients in Spain live with their families. This is a larger percent-age than any other EU country [51], and may account for why household income alone is not associated with

depression in Spain. In Finland, studies have found that depression is associated with retirement, which may be due to the fact that retirees are economically inactive [52] – this supports previous studies which found that household income is a significant determinant of depres-sive symptoms [41, 53]. Additionally, Finland has one of the strongest income gradients in health compared to other Scandinavian countries [54], and as such, it seems intuitive why in the current study, income was found to be associated with depression in Finland. Regarding interpreting the findings of the Polish data, similar cir-cumstances can account for the finding that income is inversely associated with depression. The level of health care funding in Poland represents one of the factors which contributes to the emergence and persistence of inequalities in health, including that of depression [55], and this is reflected in the data which illustrates that in-come is negatively associated with depression in Poland.

Strengths and limitations

The strength and novelty of the current study is that it is the first paper that presents the relationship between SES and depression among three European countries by apply-ing standardized designs and procedures across all survey populations. This common methodology allows to us to investigate the role or SES in countries with different cul-tural and economic statuses in Europe, maximizes cross-national transferability and comparability of the findings, and serves as the first time an accurate comparison can be made in a European context. Another major strength of this paper is the large sample size that was available, which was drawn from representative samples of non-clinical populations. Moreover, regarding the nature of the study, relatively few studies have examined SES cross-nationally, not to mention focused on specific European countries that represent different cultural and economic statuses. Additionally, our research proposes a composite score for SES based on income and education, which is also novel for the outcome of depression across European countries.

Some methodological limitations should be taken in to consideration when interpreting the findings. Firstly, the cross-sectional nature of the study renders it difficult to draw any clear conclusions regarding the direction of the SES - depression relationship, and thus limits the applicability to determine whether any of the SES indices predicts depression over time. Another challenge of the current study is that there is no formal consensus regarding the definition or measurement for SES, there-fore limiting comparison to past papers. Additionally, in-formation on social security, labor market attachment and ageing outcomes were beyond the scope of the current study. Finally, the variables 'occupation' and 'pres-tige' were omitted from the generated SES index, which some may argue is a major shortcoming, as occupation has been historically and theoretically regarded as crucial components of SES.

Conclusions

The SES index (composed of education and income) appears to predict depression symptomatology across European countries. In all countries, years of education but not income level was related to depression. In light of the dearth of cross-national research looking at the role of SES on depression in Europe, these findings have been enlight-ening; however, longitudinal studies are needed to provide further transparency regarding the direction of causality in the relationship between SES and depression. In terms of implications for policy, a concrete and valid index of SES is required in order to inform policy and research initiatives. The findings also support the notion that resources should be allocated to developing strategies to enhance economic growth and educational programmes in low SES areas in order to have positive benefits that will protect against the development and persistence of depression.

Abbreviations

CAPI: Computer-assisted personal interviewing; CI: Confidence interval; CIDI: Composite international diagnostic interview; COURAGE: Collaborative Research on Ageing in Europe; DSM-IV: Diagnostic Statistical Manual IV; MDD: Major depressive disorder; SES: Socio-economic status; WHO: World Health Organization

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Availability of data and materials

Permission to use data from the COURAGE study was obtained from the country coordinators of this study in Finland, Poland, and Spain. Due to legal restrictions, data from the COURAGE study is currently not publically available.

Authors' contributions

ST conceived the study idea. AK, ST and AF analysed and interpreted the data, and AF wrote the main body of the text. ST and AK contributed to the drafting of

the manuscript, interpreted the data, and commented for intellectual content. AK, ST, ML, CRK commented on the manuscript for intellectual content. JLAM, ML, BTA, SC, SK, JMH organized and undertook the survey. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

Consent for publication
Not applicable.

Ethics approval and consent to participate
Ethical approval for the COURAGE survey was obtained from the WHO Ethical Review Committee and local ethics research review boards (Helsinki and Uusimaa Hospital District, Finland; Jagiellonian University Medical College, Krakow, Poland; Parc Sanitari Sant Joan de Déu, Barcelona, Spain).

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3. Dissertation Summary
Zusammenfassung der Arbeit

3.1 Thematic Context

Ageing is becoming a significant public health concern, particularly in Europe, where the population structure is undergoing a dramatic shift. It is estimated that by 2050, 25% of the European population will be 65 years of age and older (WHO, 2012). This unprecedented fluctuation in the population will create a significant imbalance in the population structure, which is predicted to have a substantial impact on the existing social setting by putting additional strains on future health care systems, social security and pension systems, international economies, and on the overall health and wellbeing of society. This calls for action from international governments to create policies that will support this unprecedented population growth; therefore provisions need to be put in place in order to cater for these contingencies.

Coupled with this is the inevitable increase in mental disorders which will develop in parallel with an ageing population and will add layers of complexity to the public health issue of ageing. Depressive and anxiety disorders are prolific in older adults, and constitute the majority of late-life mental disorders (Byers et al., 2010). The impact of these disorders on older adults is significant and debilitating, where depressive disorders has been invariably associated with negative health outcomes, such as cognitive decline, increased disability, self-neglect, heart disease, diabetes, morbidity and mortality (suicide). Moreover, depression produces the greatest decrement in health compared with other chronic diseases, such as angina, arthritis, asthma and diabetes (Moussavi et al., 2007). Simultaneously, anxiety disorders, which are even more prolific in older adults, have been associated with comorbidity, reduced cognitive ability, disability, increased healthcare utilization and poor quality of life. For the purpose of this dissertation, depression will be the main focus of the papers, however,

anxiety is also addressed in one of the papers with a view to provide a broader context and to provide a more comprehensive assessment of mental disorders in the elderly, since both disorders often occur co-morbidly.

3.2 Rationale for Research

Depression transcends culture, country and boarders, and its prevalence has caused a significant public health concern across Europe. Although the prevalence of depression varies considerably across countries, it is important to understand the various contextual factors that contribute to depression within and between countries. Additionally, there are many important determinants associated with depression in older adults, (which differ to those determinants in younger cohorts) and comprise of physical disability, bereavement, cognitive decline, and other psychosocial factors such as loneliness and isolation. Considering that depressive disorders consist of distinct differences in the aetiology of depression in older adults, it is important to give late-life depression the same attention that the disorder receives in younger populations, and since the population of older adults in Europe is growing at a staggering rate, understanding the aetiology of depression in this cohort is of clinical, public and economic significance. Therefore, the main aim of the current research was to epidemiologically investigate the role of demographic and psychological variables on mental disorders, specifically depression, in the older European population, and to contribute to findings that can inform public policy measures.

3.3 Publications

Negative ageing perceptions have become a recent area of interest, and studies have reported associations between negative ageing perceptions and adverse health outcomes. Paper 1 investigated the relationship between negative ageing perceptions and its impact in the onset and persistence of depression in an older Irish population. This prospective study analysed data of older Irish adults from two consecutive waves of the Irish Longitudinal Study on Ageing (TILDA), and analyses revealed that negative ageing perceptions at baseline predicted the new onset of depression and anxiety at follow-up. Additionally, those with depression or anxiety at baseline were also significantly more likely to have these disorders persist at follow-up.

The question of whether the demographic determinants of depression are consistent across countries is an important issue. Moreover, it is of societal significance to identify whether the demographic determinants of depression are the same for older adults as they are for adults of younger cohorts. These questions were addressed in the second paper that looked at the socioeconomic status (SES) of older adults in three European countries, where the aim of the study was to evaluate the association between SES and depression across three European countries that represent different economic and cultural regions across Europe. The study looked specifically at two components of SES; education and income, and analysed the association of depression and a composite score for SES using the combined score of education and income. The findings from the analyses revealed a significant association between depression and SES across all three countries, and also found that the odds for depression significantly decreased with a higher SES score and higher education levels.

3.4 Research Findings and Implications

The findings of both papers conclude that depression is chronic and progressive, even in older age. Paper 1 suggests that having negative ageing perceptions not only predicts the prevalence of depression, but also contributes to its advancement in later life. Addressing negative ageing perceptions from a broader perspective can help to target societal attitudes towards ageing and work towards reducing the burden of depression in older adults. Furthermore, the findings from paper 2 suggest that a composite score for SES can predict depression symptomatology across countries, which has positive implications for cross-national prevention efforts. The findings from both papers suggest that depression, and anxiety, are still prolific and chronic health conditions, that warrant national and international prevention and intervention efforts in order to limit the burden of these disorders in older adulthood in our rapidly ageing society. These findings have important implications for health in Europe, and indicate the urgency of addressing depression as a public health priority in order to reduce disease burden, disability, and to improve the overall health of the European population. The papers presented in the current dissertation put forward recommendations to inform health policy makers on where best to invest resources for prevention and intervention programmes that target depression and anxiety in older adults.

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*These reference list below comprises of the full bibliography of the introduction to the subject and the summary, irrespective of whether they also appear in the published articles. The publications included have their own reference list.

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5. Appendices

5.1. Declaration of Independent Work for Dissertation (Erklärung über die eigenständige Abfassung der Arbeit)

Hiermit erkläre ich, dass ich die vorliegende Arbeit selbstständig und ohne unzulässige Hilfe oder Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Ich versichere, dass Dritte von mir weder unmittelbar noch mittelbar eine Vergütung oder geldwerte Leistungen für Arbeiten erhalten haben, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen, und dass die vorgelegte Arbeit weder im Inland noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde zum Zweck einer Promotion oder eines anderen Prüfungsverfahrens vorgelegt wurde. Alles aus anderen Quellen und von anderen Personen übernommene Material, das in der Arbeit verwendet wurde oder auf das direkt Bezug genommen wird, wurde als solches kenntlich gemacht. Insbesondere wurden alle Personen genannt, die direkt an der Entstehung der vorliegenden Arbeit beteiligt waren. Die aktuellen gesetzlichen Vorgaben in Bezug auf die Zulassung der klinischen Studien, die Bestimmungen des Tierschutzgesetzes, die Bestimmungen des Gentechnikgesetzes und die allgemeinen Datenschutzbestimmungen wurden eingehalten. Ich versichere, dass ich die Regelungen der Satzung der Universität Leipzig zur Sicherung guter wissenschaftlicher Praxis kenne und eingehalten habe.

Leipzig, den 24. November 2016

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Aislinne Freeman

5.2. Statement of own Contribution
(Darstellung des eigenen Beitrags)

5.2.1. Paper 1: Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA)

Personal Contribution:
Aislinne Freeman analysed and interpreted the data, and wrote the main body of the text.

5.2.2. Paper 1: The Role of Socio-Economic Status in Depression: Results from the COURAGE (Aging Survey in Europe)

Personal Contribution:
Aislinne Freeman analysed and interpreted the data, and wrote the main body of the text.

Leipzig, den 24. November 2016

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Aislinne Freeman

5.3. Curriculum Vitae (Lebenslauf)

Aislinné Freeman

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Professional Summary

Enthusiastic Mental Health specialist, embarking upon a professional MBA with Trinity College Dublin, having worked as a Marie Curie Fellow specialising in public health policy development and mental health research and intervention strategy. Strong foundation in research informing policy and public health activities. Experience working collaboratively with many different international institutions gaining insight into the development and implementation of policies and intervention activities on a national, international, and on an EU platform. Knowledge and skills from a broad range of industries leading to strengths in the policy and management domain. Excellent analytical and interpersonal skills.

Education

Sept '16 – Aug '18 **Masters of Business Administration** **Trinity College Dublin**

Selected as a candidate for the 2016 intake for the part-time MBA at TCD, with the maximum scholarship awarded

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Oct '13 – Ongoing **Dr. rer. med** **University of Leipzig**

Received training by international experts as part of the Marie Curie Fellowship including:

- Research Management
- Entrepreneurial Skills and Commercial Exploitation and Dissemination
- Mental health and well-being at the workplace
- Cost-effectiveness and cost-effectiveness analysis principles of Mental Health Interventions
- Grant application writing
- Translating research into policy

Nov 2015 **Masters of Public Health** **Johns Hopkins School of Public Health**

Awarded a scholarship for the Fall Institute in Barcelona. Attended courses (10 credits) from theoretical and practical learning of the Masters of Public Health Programme including:

- Problem Solving in Public Health (4 credits)
- Tools of Public Health Practice (3 credits)
- The Impact of the Financial, Economic & Political Crisis on Health, Quality of Life & Well-Being of Populations

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Sept '09–Sept '10 **MSc Investigative Psychology** **University of Liverpool**

Modules included:

- Research Methods and Statistics
- Critical Incident Decision Making
- Awarded First Class Honours in final year dissertation

Sept '04–June '07 **BA (Hons) Psychology** **NUI Maynooth**

Modules included:

- Modules included Cognitive, Developmental, Organizational and Social Psychology
- Health Psychology
- Received a First Class Honour

Professional Experience

Jan – April '16 **International Consultant in Mental Health** **WHO, Geneva**

Seconded to the World Health Organization to work on mental health policy, in the area of suicide prevention. My contribution to date has involved:

- Reviewing and providing intellectual contributions to an upcoming WHO publication on guidelines to implement a national surveillance system for suicide attempts and self-harm.
- Drafting a WHO manual on national strategies for suicide prevention to be disseminated to all UN countries
- Providing intellectual feedback for the national suicide strategies of the Cook Islands, Korea and SE Asia
- Consulting on the strategy for the launch of World Health Day, 2017

Sept '13–Sept '16 **Marie Curie Fellow** **University of Leipzig, Leipzig**

Awarded a Marie Curie Fellowship, appointed by the European Commission (EC), as part of the MARATONE (Mental Health Training through Research Network in Europe) programme.

- Undertook a secondment at the World Health Organization (WHO) in the Department of Mental Health and Substance Abuse, with a focus on the area of policy development and implementation
- Involved in the writing and publication of a number of international and collaborative projects (see below)
- Engaged in on-site collaboration for a number of projects in various European research-centres, including Parc Sanitari Sant Joan de Deu (Barcelona) and the National Suicide Research Foundation (Cork)
- Published deliverables for the EC on the epidemiology of depression and self-harming behaviours in Europe

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Nov '12–Aug '13 **Assistant Psychologist** **St. James's Hospital, Dublin**

Assistant Psychologist for the Dublin South City Adult Mental Health Department of Psychology for St. James' Hospital. Responsibilities included:

- Administering, scoring and interpreting psychometric screening measures on new clients of the service (BAI, BDI, SCL-90, WHOQoL, WAIS, MCMI-III, PAI, etc.)
- Assisting with the Clinical Interview of new clients, and writing up a report on the outcomes of the screening measures and clinical interview, which I then presented to the team to work on formulation
- Interacting with a vast array of clients presenting with varying mental health illnesses, including psychotic disorders, depressive disorders, anxiety disorders and personality disorders
- Corresponding with the client and the team regarding new referrals
- Co-facilitating inpatient groups, such as the psychosis and day hospital program

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Aug–Oct '12 **Volunteer/Consultant** **Our Lady's Parish Thigio, Kenya**

Travelled to a small impoverished community in Kenya as part of a charitable trip to effect positive change.

- Conducted research into the presence of Depression in Kenya, specifically in the community of Thigio
- Designed and presented a workshop to key stakeholders of the community around depression
- Presented the efficacy of interventions such as CBT for depression and provided information and evidence into a logistical system for supporting the victims of depression in the community
- Established a Mental Health Support service called HOPE and drafted recommendations which have since been adopted and implemented

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Jan '06–Aug '13 **Research and Fundraising Volunteer** **Pieta House, Dublin**

Volunteered with Pieta House, an international non-profit organisation for the prevention of suicide and self-harm, across various areas including:

- Data gathering and analysis using interviewing techniques in a number of small-scale research projects
- Conducted data management of results in SPSS and Excel files
- Contributed to research entitled, "Client follow up study: establishing short, medium and long term effectiveness of the Pieta intervention treatment model" Under supervision of Dr. Paul Surgenor
- Coordination, organisation and supervision of numerous fundraising events

Nov '10–July '12 **Programme Co-ordinator** **Daughters of Charity, Dublin**

St. Vincents on the Navan Road in Dublin is a service for adults with intellectual disabilities provided by the Daughters of Charity. My achievements in this position include:

- Pioneered, developed and implemented a behavioural support and skills training group called ACHIEVE for young men with intellectual disabilities and behavioural problems
- Liaised with a broad multidisciplinary team to provide effective, individualised programmes
- Provided positive behaviour support through the means of creative arts, group interaction, community involvement and one-on-one support
- Assisted in the production of reports into the assessment, implementation, monitoring and evaluation of behavioural programmes of individual service users

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Dec '09–Sept '10 **Policy Consultant** **Gtr. Manchester Fire & Rescue Service, U.K.**

As a graduate student I was approached by the Fire and Rescue service to conduct a research project into the efficacy of procedures within the Greater Manchester Fire Department.

- Conducted research into a logistical system for recording decisions made during critical incidents.
- Conducted and evaluated a number of small-scale projects into the requirements, efficiency, and safety of recording decisions made by the officers in situ
- Drafted recommendations that have been adopted and implemented by the British Fire and Rescue Service

Awards & Scholarships

- Awarded the maximum scholarship from Trinity College Dublin for the part-time MBA (2016)
- Scholarship from Johns Hopkins Bloomberg School of Public Health for the Masters of Public Health (2015)
- Received the prestigious Marie Curie Fellowship (2013 – 2016)
- Awarded the Entrance Scholarship at NUI Maynooth for high academic achievement (2004 -545 Leaving Cert points)

5.4 Publications and Presentations

5.4.1 Publications

Freeman, A.T., Santini, Z.I., Tyrovolas, S., Rummel-Kluge, C., Haro, J.M., Koyanagi, A. (2016). Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA). *Journal of Affective Disorders, 199: 132-138.*

Freeman, A.T., Tyrovolas, S., Koyanagi, A., Chatterji, S., Leonardi, M., Ayuso-Mateos, J.L., Tobiaz-Adamczyk, B., Koskinen, S., Rummel-Kluge, C., Haro, J.M. The Role of Socio-Economic Status in Depression: Results from the COURAGE (Aging in Europe). *BMC Public Health (2016) 16:1098.*

Ivandic, I., **Freeman, A.T.**, Birner, U., Nowak, D., Sabariego, C. A Systematic Review of Brief Mental Health and Well-being Interventions in Organizational Settings. *Scandinavian Journal of Work, Environment & Health. (Under Revision).*

Filatova, S., Koivumaa-Honkanen, H., Hirvonen, N., **Freeman, A.T.**, Ivandic, I., Khandaker, G.M., Jones, P.B., Jääskeläinen, E., Moilanen, K., Miettunen, J. Early Motor Developmental Milestones and Schizophrenia: a systematic review and meta-analysis. *Schizophrenia Research. (Under Revision).*

Freeman, A.T. (2014). Review of: Suicide: Theory, Research and Practice. *The Irish Psychologist, pp. 254.*

Freeman, A.T., Ni Bhrion, E. (2014). Division of Neuropsychology Seminar on Assessment of Intelligence and Use in Neuropsychological Assessment. *The Irish Psychologist, pp. 349.*

5.4.2. Presentations

Freeman, A.T., Santini, Z.I., Tyrovolas, S., Rummel-Kluge, C., Haro, J.M., Koyanagi, A. (2016). Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA). *Poster Presentation at the 2nd World Congress of Early Career Psychiatrists, Athens, Greece.* October 2016. Received first prize for Poster Competition.

Freeman, A.T., Santini, Z.I., Tyrovolas, S., Rummel-Kluge, C., Haro, J.M., Koyanagi, A. (2016). Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA). *Oral Presentation at the 5th European Conference on Mental Health, Prague, Czech Republic*, September 2016.

Freeman, A.T., McCarthy, J., Mergl, R., Rummel-Kluge, C., Arensman, E. The Clinical Utility and Reliability of the Assessment of Suicide Intent using Becks Suicide Intent Scale. *Poster presentation at the 16th European Symposium on Suicide and Suicidal Behaviours, Oviedo, Spain.* September 2016.

Freeman, A.T., Mergl, R., Kohls, E., Koburger, N., Székely, A., Gusmao, R., Arensman, E. Hegerl, U., Rummel-Kluge, C. A Cross-National Study on Gender Differences in Suicide Intent. *Oral presentation at the 28th World Congress of the International Association for Suicide Prevention, Montreal, Canada.* June 2015.

Freeman, A.T., Mergl, R., Kohls, E., Koburger, N., Székely, A., Gusmao, R., Arensman, E. Hegerl, U., Rummel-Kluge, C. A Cross-National Study on Gender Differences in Suicide Intent. *Poster presentation at the 15th European Symposium on Suicide and Suicidal Behaviours, Tallinn, Estonia.* August 2014.

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